POGLUT1 gene

protein O-glucosyltransferase 1

Normal Function

The *POGLUT1* gene provides instructions for making a protein called protein O-glucosyltransferase 1. This protein is located in a cell structure called the endoplasmic reticulum, which helps with protein processing and transport. Protein O-glucosyltransferase 1 adds sugar molecules, specifically a sugar called glucose, to other proteins called Notch receptors. Notch receptors are a family of proteins that are involved in a signaling pathway that guides normal development of many tissues throughout the body, both before birth and throughout life. Receptor proteins have specific sites into which certain other proteins, called ligands, fit like keys into locks. Attachment of a ligand into a Notch receptor triggers signaling in the Notch pathway.

The addition of glucose molecules alters the shape of the Notch receptor. The receptor is then able to attach (bind) to its ligand and trigger signaling. Through its integral role in Notch receptor function, protein O-glucosyltransferase 1 allows the Notch pathway to proceed. The Notch pathway regulates a variety of processes including the specialization of cells into certain cell types that perform particular functions in the body (cell fate determination). It also plays a role in cell growth and division (proliferation), maturation (differentiation), and self-destruction (apoptosis).

In skin cells, Notch signaling likely plays a role in the maintenance of precursor cells that mature into pigment-producing skin cells called melanocytes and may regulate interactions between melanocytes and other skin cells called keratinocytes. Protein O-glucosyltransferase 1 is found in high levels in skin cells, particularly in the outermost layer of skin (epidermis) where melanocytes are abundant, and may have additional functions in the skin besides its involvement in Notch signaling.

Health Conditions Related to Genetic Changes

Dowling-Degos disease

At least 11 mutations in the *POGLUT1* gene have been found to cause Dowling-Degos disease. This condition results in various skin abnormalities, including a characteristic lacy pattern of abnormally dark skin coloring (hyperpigmentation) that occurs most often in the body's folds and creases.

Most of the *POGLUT1* gene mutations that cause Dowling-Degos disease lead to an abnormally short protein with no function or change single protein building blocks (amino acids) resulting in a partial loss of protein function. As a result, protein O-glucosyltransferase 1 is less able or unable to add glucose molecules to Notch receptors. Without these sugar molecules, Notch receptors cannot bind to their

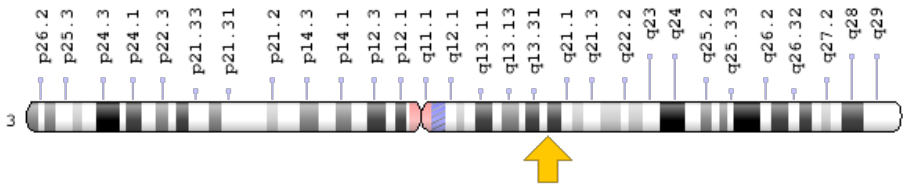
ligands and the Notch pathway is halted. Because the varied functions of the Notch pathway affect many body systems and Dowling-Degos disease affects only the skin, it is unclear whether the signs and symptoms of this condition are due to impaired Notch signaling or disruption of an unknown function of protein O-glucosyltransferase 1 in melanocytes or other skin cells.

Limb-girdle muscular dystrophy

Chromosomal Location

Cytogenetic Location: 3q13.33, which is the long (q) arm of chromosome 3 at position 13.33

Molecular Location: base pairs 119,468,955 to 119,494,708 on chromosome 3 (Homo sapiens Updated Annotation Release 109.20200522, GRCh38.p13) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- C3orf9
- CAP10-like 46 kDa protein
- CLP46
- hCLP46
- hRumi
- KDELC family like 1
- KDELCL1
- KTEL (Lys-Tyr-Glu-Leu) containing 1
- KTEL motif-containing protein 1
- KTELC1
- LGMD2Z
- MDS010
- MGC32995

- O-glucosyltransferase Rumi homolog
- protein O-xylosyltransferase
- Rumi

Additional Information & Resources

Educational Resources

- The Cell: A Molecular Approach (second edition 2000): Notch Signaling
  https://www.ncbi.nlm.nih.gov/books/NBK9918/#A2279

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28POGLUT1%5BTIAB%5D%29+OR+%28protein+O-glucosyltransferase+1%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- PROTEIN O-GLUCOSYLTRANSFERASE 1
  http://omim.org/entry/615618

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_POGLUT1.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=POGLUT1%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:22954
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:56983
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/56983
- UniProt
  https://www.uniprot.org/uniprot/Q8NBL1

Sources for This Summary

- Basmanav FB, Oprisoreanu AM, Pasternack SM, Thiele H, Fritz G, Wenzel J, Größer L, Wehner M, Wolf S, Fagerberg C, Bygum A, Altmüller J, Rütten A, Parmentier L, El Shabrawi-Caelen L, Hafner C, Nürnberg P, Kruse R, Schoch S, Hanneken S, Betz RC. Mutations in POGLUT1, encoding protein O-glucosyltransferase 1, cause autosomal-dominant Dowling-Degos disease. Am J Hum Genet. 2014 Jan 2;94(1):135-43. doi: 10.1016/j.ajhg.2013.12.003.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/24387993
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3882728/
- Chen M, Li Y, Liu H, Fu X, Yu Y, Yu G, Wang C, Bao F, Liany H, Wang Z, Shi Z, Zhang D, Zhou G, Liu J, Zhang F. Analysis of POFUT1 gene mutation in a Chinese family with Dowling-Degos disease. PLoS One. 2014 Aug 26;9(8):e104496. doi: 10.1371/journal.pone.0104496. eCollection 2014.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/25157627
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4144801/
- OMIM: PROTEIN O-GLUCOSYLTRANSFERASE 1
  http://omim.org/entry/615618
- Wilson NJ, Cole C, Kroboth K, Hunter WN, Mann JA, McLean WH, Kernland Lang K, Beltraminelli H, Sabroe RA, Tiffin N, Sobey GJ, Borradori L, Simpson E, Smith FJ. Mutations in POGLUT1 in Galli-Galli/Dowling-Degos disease. Br J Dermatol. 2017 Jan;176(1):270-274. doi: 10.1111/bjd.14914. Epub 2016 Sep 24.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/27479915
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5324688/

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